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Clinical Correlates and Mediators of Self-Concept in Youth with Chronic Tic Disorders

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Abstract

This study investigated the clinical correlates and mediators of self-concept in youth with Chronic Tic Disorders (CTD). Ninety-seven youth aged 6–17 ($M = 11.1 \pm 2.89$; 79.4 % male) with CTD were administered the Yale Global Tic Severity Scale, the Piers-Harris Children's Self-Concept Scale—Second Edition, and self-report and clinician-administered measures assessing behavioral and psychological difficulties and comorbid conditions. Youth with CTD had a slightly below average level of self-concept, with 20 % ($n = 19$) exhibiting low self-concept. Youth with CTD-only had greater self-concept relative to youth with CTD and obsessive-compulsive disorder (OCD) ($p = 0.04$) or CTD, OCD, and attention deficit hyperactivity disorder (ADHD) combined ($p = 0.009$). Medium-to-large-sized associations were observed between youth's self-concept and clinical characteristics (e.g., severity of ADHD, OCD and depressive symptoms). Youth's self-concept partially mediated the relationship between tic severity and depressive symptom severity, and the interaction between tic impairment and youth's reliance on avoidant coping strategies moderated youth's self-concept. Implications, limitations, and recommendations for future interventions are discussed.

Keywords

Tourette Disorder; Chronic Tic Disorders; Self-concept; Depression; Avoidance

Introduction

Chronic Tic Disorders (CTD), including Tourette Disorder (TD) and Chronic Motor or Vocal Tic Disorder, are neuropsychiatric disorders with a childhood onset that are characterized by the presence of motor and/or vocal tics for a least 1 year. Although both conditions are considered CTDs, a full TD diagnosis requires that both motor and vocal tics are present. Tics are sudden, recurrent, non-rhythmic movements or vocalizations that can be either simple or complex, and often wax and wane in severity over time. Tics occur in approximately 3 % of school-aged youth [1], with prevalence estimates of CTD ranging from 3 to 8 in every 1000 children [2, 3]. CTDs are more common in males, and frequently present with comorbid obsessive compulsive disorder (OCD) and attention deficit hyperactivity disorder (ADHD) [4–7]. Along with tics and comorbid psychiatric conditions, youth living with CTD often experience a wide range of behavioral and psychological impairment, including greater psychosocial stress [8], social deficits [9], disruptive behavior [10, 11], peer victimization [12, 13], anxiety and/or mood disturbances [14], and learning disabilities [15].

Although tics can be managed effectively with behavioral [16, 17] and pharmacological interventions [18], these interventions infrequently result in tic symptom remission. Indeed, some tics may persist amidst the evidence-based treatments, and have been identified as having the greatest negative impact on an individual's self-concept between ages 7 and 12 years, when the frequency and intensity of symptoms tend to be at their worst [19]. Deficits in a child's self-concept can have a detrimental impact on their quality of life, and is also a highly influential factor in the success or failure of real-life outcomes [20–23]. Findings from the Longitudinal Study of Generations ($N = 1824$, ages 16–97 years) indicated that self-esteem has a significant prospective impact on important life outcomes such as relationship satisfaction, job satisfaction, salary, positive and negative affect, depression, and health, and was identified as a predictor, not a consequence, of these domains [22].

Despite the recognized importance of self-concept, few studies have examined the self-concept in youth or adults with CTD. De Lange and Oliver [24] found that adolescents with TD ($N = 21$) had significantly lower academic (i.e., attitude towards school, own evaluation of school work, perception of academic abilities), non-academic (i.e., physical, personal, family, social, self-criticism), and global self-concept than non-TD youth. Conversely, Stokes et al. [25] found that youth with TD reported self-concept in the normative range; however, these youth were rated by their teachers and peers as significantly more withdrawn, aggressive, and less popular than their classmates. Similarly, Edell-Fisher et al. [26] found that youth with TD did not significantly differ in regards to overall self-concept compared to control subjects' self-report on the Piers-Harris Children Self-Concept Scale. However, analyses of Piers-Harris subscale scores identified that youth with TD acknowledged having significantly more problematic behaviors in home and school settings than the matched control group. Although a small-to-moderate negative association was observed between tic severity and global self-concept ($r = -.33$), these findings did not reach statistical significance [26]. The mixed evidence for impaired self-concept in youth with CTD may be accounted for by other factors, such as the compounding burden of comorbid conditions.

Indeed, the relationship between self-concept and CTD may be complicated by common comorbid psychiatric conditions. For instance, several studies have found that youth with ADHD exhibit low self-concept compared to youth without ADHD [27–33]. Conversely, a growing body of literature suggests that some youth with ADHD may exhibit a phenomenon termed the *positive illusory bias*, in which they exhibit an inflated self-perception in comparison to other criteria reflecting their actual competence [34–36]. Beyond ADHD, evidence suggests an association between the presence of depression and anxiety symptoms with deficits in self-concept in youth [37–40]. Although there has been little exploration of deficits of self-concept in individuals with OCD, Thibert et al. [41] found that adults with TD and comorbid obsessive–compulsive symptoms had significantly lower self-concepts than the general population, which was not observed for TD alone. These investigators suggested that the presence of obsessive–compulsive symptoms may contribute to poor psychosocial adaptation to the obvious symptoms often associated with TD, as these individuals tend to be perfectionistic and preoccupied with their own deficits [41].

Given the recognized importance of self-concept and its minimal examination, we examined self-concept in a large sample of youth with CTD. First, we investigated the self-concept reported by youth with CTD, and examined the compounding burden of comorbid psychiatric disorders. Given conflicting findings in the existing literature regarding associations between the presence of CTD and self-concept, we did not develop a hypothesis regarding the proportion of CTD youth with self-concept deficits. However, we did expect that youth with comorbid ADHD and OCD would have significantly more self-concept deficits than the normative population given the existing literature that supports these associations in CTD and non-CTD samples [27, 30, 37, 38]. Second, we examined the association between youth's overall self-concept and relevant clinical correlates (i.e., tic severity, tic-related impairment, quality of life, severity of behavioral and/or emotional problems). Given prior associations between elevated tic severity and deficits in self-concept [26], we hypothesized that youth presenting with more severe tics would report lower self-concept. Third, given previous findings that greater tic symptom severity is associated with greater depressive symptom severity [42] and existing cognitive mediation models of depression positing that children may perceive negative life events (e.g. severe tic symptomology) as veridical information about themselves which can negatively shape their self-concept and foster depressive symptomology [43–45], we examined whether youth's overall self-concept mediated the relationship between tic symptom severity and depressive symptom severity. Finally, given the previous association identified between passive-avoidant coping strategies (i.e., withdrawal, fatalistic attitudes, and avoidance) and low self-concept [46, 47], as well as existing evidence that avoidance coping predicts poorer adjustment to illness in non-CTD samples [48], we explored whether youth's reliance on avoidant coping strategies influenced the relationship between tic impairment and self-concept.

Methods

Participants

Participants included 97 children and adolescents, ages 6–17 years ($M = 11.1 \pm 2.89$; 79 % male) with a clinician-diagnosis of TD or Chronic Motor or Vocal Tic Disorder. Youth and caretakers were recruited from the normal patient flow of the University of South Florida's (USF) Rothman Center for Pediatric Neuropsychiatry as part of a larger study funded by the Centers for Disease Control and Prevention examining psychosocial functioning among youth with CTD [49] (see Table 1 for further characteristics). Eligible subjects were consecutively enrolled from March 2010 to September 2012. Inclusion criteria for study participation included: (1) a confirmed CTD with duration of 1 year; and (2) between 6 and 18 years of age at the time of evaluation. Participants were excluded if there was a significant intellectual disability or diagnosis of psychosis, mania, suicidal intent, or any other psychiatric condition that would limit the child's ability to understand or complete study assessments.

Measures

Piers-Harris Children's Self-Concept Scale—Second Edition—The PH-2 [50] is a 60-item self-report measure of self-concept for children and adolescents aged 7–18 years. The PH-2 yields a Total Self-Concept Score, as well as multidimensional self-concept across six domains including: Behavioral Adjustment (BEH; 14-items measuring admission/denial of problematic behaviors), Intellectual and School Status (INT; 16-items measuring the child's evaluation of their own intellectual/academic abilities), Physical Appearance and Attributes (PHY; 11-items measuring a child's assessment of his/her own physical appearance and personality attributes), Happiness and Satisfaction (HAP; 10-items measuring a child's feelings of happiness/satisfaction with life), Freedom from Anxiety (FRE; 14-items measuring anxiety and dysphoric mood), and Popularity (POP; 12-items measuring the child's evaluation of their own social functioning), with higher scores indicating higher self-concept in each domain. Children are asked dichotomously scaled (yes/no) questions with both positively and negatively worded items to reduce negative response bias, and two validity scales are provided to gauge Inconsistent Responding (INC) and Response Bias (RES). PH-2 Total Score and Subscale T-scores falling below 40 indicate low self-concept, and T-scores greater than 60 indicate high self-concept. Satisfactory reliability and validity of the PH-2 have been observed [50, 51]. Given the wide age range in our sample, T-scores were used to correct for age and gender in our analyses.

Yale Global Tic Severity Scale (YGTSS)—The YGTSS [52] is a clinician-rated, semi-structured interview used to assess the presence and severity of motor and phonic tics over the preceding 7–10 days. Endorsed motor and phonic tics are rated individually on a 0–5 point scale according to number, frequency, intensity, complexity and interference, yielding a Total Tic Severity Score ranging from 0 to 50. After administration, a one item Total Tic Impairment Score ranging from 0 to 50 is also identified, indicating the degree of associated life impairment across interpersonal, academic, and/or occupational realms. The YGTSS demonstrates strong psychometric properties including excellent reliability [52, 53], validity [54], and treatment sensitivity [55, 56].

Children's Coping Strategies Checklist: Revision 1—The CCSC-R1 [57] is a 54-item self-report questionnaire that measures coping strategies in children within 4 domains: Active Coping (planning/thinking about ways to solve the problem); Avoidance Strategies (efforts of avoiding the problem by staying away from it or leaving it); Support Seeking Strategies (the use of other people as resources to assist in seeking solutions to the problem situation); and Distraction Strategies (efforts to avoid thinking about the problem situation by using distracting stimuli). The CCSC-R1 questions describe different coping efforts the children have used in the past month rated on a 4-point Likert scale (1 = never, 2 = sometimes, 3 = often, 4 = most of the time) [57].

Children's Yale–Brown Obsessive–Compulsive Scale (CY-BOCS)—The CY-BOCS [58] is a clinician administered, semi-structured scale that measures the presence and severity of obsessive and/or compulsive symptoms over the preceding week. The CY-BOCS consists of two five-item sub-scales, obsession and compulsion severity, which are derived by summing the five respective scale items. All ten items are combined to create a CY-BOCS Total Score, with higher scores indicating more severe symptoms. The CY-BOCS has demonstrated excellent reliability and validity [58–61].

Children's Depression Inventory: Short Form (CDI-S)—The CDI-S [62] is a 10-item child-report measure that assesses the presence and severity of cognitive, affective, or behavioral symptoms of depression experienced by the child. The scale targets factors such as negative mood, anhedonia and poor self-esteem over the previous 2 weeks, with higher scores suggesting more severe depressive symptomology. The CDI/CDI-S has demonstrated good reliability and validity [62–65].

Swanson Nolan and Pelham Rating Scale: Fourth Revision—The SNAP-IV [66] is a 26-item, parent-rated questionnaire used to assess ADHD-related symptoms, including nine items for inattention, nine items for hyperactivity/impulsivity, and eight items assessing oppositional defiant disorder (ODD) symptoms. Each item is scored on a 4-point Likert scale (0 = not at all, 1 = just a little, 2 = pretty much, 3 = very much) and average rating per domain is calculated.

Child Behavior Checklist for Ages 6–18—The CBCL [67] is a 113-item parent-report questionnaire that measures the frequency and intensity of behavioral and emotional problems in youth within the last 6 months. Parents rate items on a 3-point Likert scale (0 = not true, 1 = somewhat or sometimes true, 2 = very or often true). The CBCL consists of eight syndrome scales and two composite scales that assess internalizing (Withdrawn, Anxious/Depressed, Somatic Complaints, Social Problems, Thought Problems) and externalizing (Attention Problems, Aggressive Behavior, Delinquent Behavior) forms of psychopathology [68]. The two composite scales (Internalizing and Externalizing) were included in this report. The CBCL has demonstrated excellent psychometric properties [68].

The PedsQL Family Impact Module—The Peds-QL-FIM [69] was designed to measure the impact of pediatric chronic health conditions on parents and the family. The Peds-QL-FIM Total Mean Score incorporates parent-reported difficulties of youth's physical, emotional, social, and cognitive functioning as well as their difficulties with family daily

activities and family relationships. Items are rated on a 5-point Likert scale (0 = never, 1 = almost never, 2 = sometimes, 3 = often, 4 = almost always) which are reverse scored and linearly transformed to a 0–100 scale, with lower scores indicating higher Health-Related Quality of Life (HRQOL).

Procedures

The study was approved by the local Institutional Review Board. Eligible participants were identified via phone screeners conducted by the study coordinator and were subsequently scheduled for a single visit to the USF Rothman Center for Pediatric Neuropsychiatry. Written informed consent and assent was obtained from caretakers and youth, respectively. As part of a larger study examining psychosocial functioning among youth with CTD, youth and their caretakers participated in a 3–4 h study visit that included several clinician-administered assessments (e.g., YGTSS, CY-BOCS) and several child-and parent-report questionnaires (e.g., PH-2, CCSC-R, CDI-S, SNAP-IV, CBCL, Peds-QL-FIM) aimed to capture the presence and severity of psychological and behavioral difficulties. Board-certified physicians and psychologists with substantial experience with tic disorders among youth administered the YGTSS jointly to children and caretakers. Tic and comorbid diagnoses were assigned using best estimate procedures [70], in which consensus between Ph.D./ M.D. investigators and expert review by the PI was ascertained, guided by a comprehensive review of clinical interview, extensive medical records, and clinician administered and self-report rating scales (see Leckman et al. [70] for a description). Families were compensated \$25 for completing all assessments and rating scales.

Analytic Plan

Missing data were minimal and were determined to be missing completely at random (MCAR) using Little's MCAR test ($p = 0.67$) [71]. Expectation–Maximization method was used to impute missing values, which is an iterative procedure that uses other variables to impute likely estimate values based on available data [72]. Values were imputed for the following measures and/or one of their subscales: PH-2 ($n = 1$); SNAP ($n = 1$); CBCL ($n = 1$); and Peds-QL-FIM ($n = 2$). Descriptive statistics were used to characterize the sample, with categorizations of self-concept T-scores provided by the PH-2 manual (see PH-2 description in measures section for self-concept ranges). An independent sample t test compared differences in self-concept between genders. A one-way analysis of variance (ANOVA) compared youth's overall level of self-concept (PH-2 Total Score) among youth with CTD and co-occurring disorders (CTD-only, CTD + ADHD, CTD + OCD, CTD + ADHD + OCD), with Cohen's d measuring the magnitude of these differences. Pearson correlations examined the association between youth's overall self-concept (PH-2 Total Score) and clinical characteristics (YGTSS Total Tic Severity Score, YGTSS Total Impairment Score, SNAP-IV Inattention, SNAP-IV Hyperactivity/Impulsivity, SNAP-ODD, CY-BOCS Total Score, CDI-S Total Score, CBCL Internalizing, CBCL Externalizing, and Peds-QL-FIM Total Mean Score). Given the exploratory nature of these examinations, the significance level was set to $p = 0.05$. Boot strapping techniques tested whether youth's overall self-concept (PH-2 Total Score) mediated the relationship between tic symptom severity (YGTSS Total Tic Severity Score) and depressive symptom severity (CDI Total T-score). Full mediation was considered to occur when indirect effect was significant and the c

' path was not significant, whereas partial mediation was considered to occur when the indirect effect was significant. The K^2 statistic was used to evaluate the effect size (ES) of the mediation, with values of 0.01, 0.09, and 0.25 corresponding to small, medium and large ES [73]. Boot strapping techniques also tested whether the interaction between youth's reliance on avoidant coping strategies (CCSC-R Avoidance) and their tic-related impairment (YGTSS Impairment Score) moderated/predicted their overall self-concept (PH-2 Total Score). Bootstrap analyses were conducted using 5000 bootstrap samples and bias-corrected 95 % confidence intervals (CI). Boot strapping procedures were completed using the SPSS Macro PROCESS [74].

Results

Self-Concept Among Youth with CTD

Table 2 provides the individual subscales and overall rating of self-concept among youth with CTD relative to normative data. In general, youth with CTD had a slightly below average level of overall self-concept, which was consistent across self-concept subscales. Although exhibiting slightly lower self-concept scores, the distribution of these scores appeared to be normatively distributed. Twenty percent of youth with CTD ($n = 19$) had low overall self-concept, 64 % had average overall self-concept ($n = 62$), and only 17 % had high overall self-concept ($n = 16$). An independent sample t-test found no significant differences between males ($n = 77$) and females ($n = 20$) with CTD in overall self-concept ($p = 0.44$) or subscales ($p = 0.16$ – 0.65).

Self-Concept and Comorbidity Among Youth with CTD

Thirty youth had CTD alone, 23 had CTD + ADHD, 19 had CTD + OCD, and 24 had CTD + ADHD + OCD. An ANOVA revealed a significant difference in overall self-concept between comorbid disorders, $F(3, 92) = 4.43$, $p = 0.006$. Bonferroni post hoc tests revealed that youth with CTD only ($M = 53.60$, $SD = 11.17$) had significantly higher self-concept relative to youth with CTD + OCD ($M = 45.32$, $SD = 10.87$, $p = 0.04$, $d = 0.75$) and CTD + ADHD + OCD ($M = 44.42$, $SD = 9.25$, $p = 0.009$, $d = 0.90$), but this difference was not significant between youth with CTD only and CTD + ADHD ($M = 49.74$, $SD = 9.56$, $p = 1.00$, $d = 0.36$).

Clinical and Demographic Correlates of Self-Concept

Table 2 presents the association between self-concept and participant's age and clinical characteristics. Small-to-moderate negative associations were observed between youth's overall self-concept and their tic severity and tic-related impairment. Meanwhile, medium-to-large negative associations were found between youth's overall self-concept and their ADHD symptom severity, ODD symptom severity, obsessive-compulsive symptom severity and depressive symptom severity. Moderate positive associations were observed between youth's overall self-concept and overall quality of life. The magnitude of these associations was relatively consistent across individual subscales of self-concept and clinical characteristics. Although there was no significant association between youth's overall self-concept and age, small negative associations between youth's age and the individual self-concept subscales of FRE, POP and HAP were observed.

Impact of Self-Concept on the Relationship Between Tic Severity and Depressive Symptom Severity

Figure 1 presents the estimated effects for the purposed mediation relationship between tic symptom severity, self-concept, and child-reported depressive symptom severity. A linear regression revealed that tic severity accounted for 17 % of the variance in depressive symptom severity ($R^2 = 0.17$, $p < 0.001$). Bootstrapping mediation analyses identified that the indirect effect of self-concept (0.20, 95 % CI 0.08, 0.35) partially mediated the relationship between tic severity and depressive symptom severity, with a medium-to-large effect size ($\kappa^2 = 0.16$, 95 % CI 0.06, 0.27). Upon further examination, a distinct pattern of age effects emerges between children and adolescents. For children (aged 6–12 years), bootstrapping mediation analyses identified that the indirect effect of self-concept (0.16, 95 % CI –0.01, 0.38) did not significantly mediate the relationship between tic severity and depressive symptom severity, with a medium effect size ($\kappa^2 = 0.12$, 95 % CI 0.01, 0.26). Meanwhile for adolescents (aged 13–17 years), bootstrapping mediation analyses found that the indirect effect of self-concept fully mediated the relationship between tic severity and depressive symptom severity (0.23, 95 % CI 0.08, 0.48), with a large effect size ($\kappa^2 = 0.25$, 95 % CI 0.07, 0.41).

Interaction Between Tic Impairment and Avoidant Coping Strategies on Youth's Self-Concept

Figure 2 displays bootstrapping moderation analyses for the relationship between tic impairment, avoidant coping, and self-concept. Youth's YGTSS Total Tic Impairment Score was a significant predictor of their overall self-concept on the PH-2. Additionally, youth's reliance on avoidant coping strategies also served as a significant predictor of their overall self-concept on the PH-2. Bootstrapping moderation analyses presented in Fig. 2 identified that the interaction between tic impairment and avoidance coping strategies moderated youth's overall self-concept on the PH-2 [$R^2 = 0.02$, $F(1, 92) = 4.53$, $p = 0.04$]. The collective model of tic impairment, avoidant coping strategies, and their interaction accounted for approximately 54 % of the variance in youth's overall self-concept [$R^2 = 0.54$, $F(3, 92) = 35.62$, $p < 0.001$]. Interestingly, a similar pattern of age effects was observed in this moderation model. For children (ages 6–12 years), bootstrapping moderation analyses identified that the interaction between tic impairment and avoidance coping did not significantly moderate youth's overall self-concept on the PH-2 [$R^2 = 0.01$, $F(1, 64) = 1.05$, $p = 0.31$]. Meanwhile for adolescents (aged 13–17 years), bootstrapping moderation analyses identified that the interaction between tic impairment and avoidance coping did significantly moderate youth's overall self-concept on the PH-2 [$R^2 = 0.08$, $F(1, 25) = 4.60$, $p = 0.04$].

Discussion

This study examined the clinical correlates and mediators of self-concept reported by youth with CTD. Overall, youth with CTD reported slightly lower than average self-concept, with twenty percent reporting low overall self-concept. Consistent with previous findings [41], youth with CTD alone had significantly higher self-concept relative to youth with comorbid OCD and/or ADHD + OCD, suggesting that the presence of obsessive–compulsive

symptoms may contribute to greater deficits in psychosocial adaptation, as these individuals are often perfectionistic and preoccupied with their own deficits. Contrary to existing literature suggesting that youth with ADHD are significantly more at-risk for deficits in self-concept [27–31], a significant difference in self-concept between youth with CTD-only and CTD + ADHD was not observed in this sample. This discrepancy may be explained by the presence of a *positive illusory bias*, or an inflated self-perception, exhibited by some youth with comorbid ADHD, which has been identified in previous samples [34–36]. Consistent with previous findings [33], however, youth with more severe ADHD symptomology were more likely to report lower self-concept than those with less severe symptoms, suggesting that severity, rather than presence, of symptoms may be a risk factor for low self-concept in youth.

Given previous findings that greater tic symptom severity is associated with greater depressive symptom severity [42], we examined the influence of self-concept on the relationship between tic severity and depressive symptom severity. We found that self-concept partially mediated the relationship between tic severity and depressive symptoms accounting for a significant portion of variance. Although tic symptoms can still influence youth's depressive symptom severity, a significant proportion of these depressive symptoms are driven by youth's poor self-concept. This is supported by previous research theorizing that children may regard negative life events (e.g., severe tic symptomology) as containing veridical information about themselves, negatively shaping their self-perceptions and engendering the path for depressive symptomology [43–45]. Further, both tic-related impairment and youth's reliance on avoidant coping strategies (e.g., making efforts to avoid problem, repressing thoughts about problem, using wishful thinking that problem was better) served as significant predictors of youth's overall self-concept. The interaction between tic-related impairment and avoidance coping strategies moderated youth's overall self-concept. This finding is consistent with previous associations identified between youth that utilize passive-avoidant coping strategies (i.e., trying to forget the problem, avoiding a stressful trigger, social withdrawal, etc.) and low self-concept, psychological distress, and poor adjustment to illness-related impairment in non-CTD samples [46–48]. The identification of this moderation effect suggests potential clinical implications: reducing maladaptive coping strategies may alleviate the burden of tic-related impairment on adaptive functioning and self-concept.

While the presence and severity of tics may typically be a primary focus of treatment interventions, the present results suggest that it may also be beneficial for the treating clinician to address psychosocial variables (e.g., self-concept) to improve overall functioning and protect/reduce depressive symptoms. Indeed, preliminary work has demonstrated the benefit of a cognitive behavioral intervention for youth with CTD to reduce tic-related impairment and improve self-concept and quality of life [75, 76]. Such cognitive behavioral interventions may serve as a complementary therapeutic option to help youth who have already received evidence-based treatment learn to manage and cope with persistent tics and associated psychosocial problems.

Results of the present study should be interpreted within the context of several limitations. First, our sample was modest in size compared to previous studies examining CTD.

However, this report represents the largest study of self-concept in youth with CTD to date. Second, our sample was predominately male and/or Caucasian. As such, our findings may not be generalizable to a more diverse population. Third, there was no demographically matched comparison group (psychiatric controls or healthy controls). Rather, comparison data comes from normative samples that are significantly larger and more diverse than the sample that would be produced from our recruitment population. Fourth, the inclusion of children and adolescents from a wide age range (6–17 years old) may limit our findings relating to self-concept as a mediating variable, as younger children are significantly less likely to exhibit depressive symptoms [77], and tend to report higher self-concepts, which later declines in adolescence [78]. Despite this difference between children and adolescents, our overall findings were still significant using the entire age range, even with the inclusion of younger children. Further, this evaluation of age ranges is largely consistent with treatment studies of youth with CTD (i.e., 8–16; Piacentini et al. [79]). Finally, the cross-sectional nature of the study's design produces findings that are correlational in nature, which precludes the exploration of causal relationships among variables. Future studies examining self-concept across multiple time-points would allow for prospective identification and directionality of current effects.

Despite these limitations, the present findings have clinical implications for assessment and treatment of youth with CTD and comorbid psychopathology. In regards to assessment, examination of a youth's self-concept and coping strategies should be considered when evaluating youth with CTD [80], as it may have a strong influence on depressive symptomology, overall functioning, and quality of life. Further, the compounding burden of comorbid conditions, particularly OCD, may have an impact on a child's self-concept. From a treatment perspective, current intervention strategies predominantly focused solely on tic severity may not directly address many of the associated challenges youth with CTD face. As such, future research should examine treatment strategies aimed at improving self-concept and quality of life, and reduce tic-impairment and avoidant coping strategies in addition to reducing tic symptom severity.

Summary

This study reports the clinical correlates and mediators of self-concept among 97 youth with CTD. Findings from this study suggest that youth with CTD had a slightly below average level of self-concept when compared to a normative sample of youth, with 1/5 exhibiting low self-concept. Further, youth with co-occurring OCD or OCD + ADHD in addition to their CTD diagnosis had lower self-concept relative to youth CTD alone. Small-to-moderate-sized associations were observed between youth's self-concept and clinical characteristics such as their tic severity and tic-related impairment, while medium-to-large negative associations were found between youth's overall self-concept and their ADHD symptom severity, ODD symptom severity, obsessive-compulsive symptom severity and depressive symptom severity. Youth's self-concept partially mediated the relationship between tic severity and depressive symptom severity, and the interaction between tic impairment and youth's reliance on avoidant coping strategies moderated youth's self-concept. Although study limitations should be noted, these data provide potentially

important information regarding the clinical correlates of self-concept among youth with CTD.

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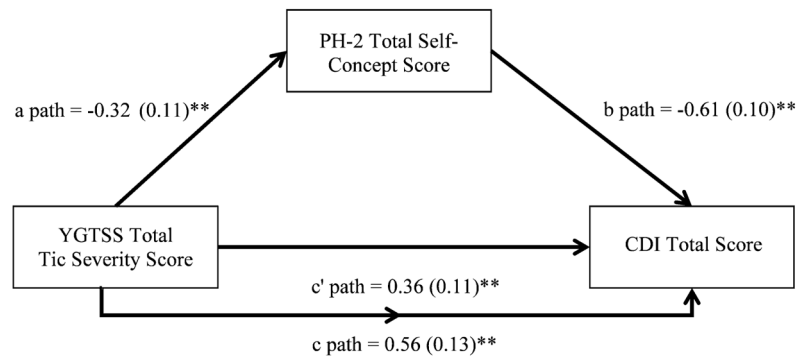
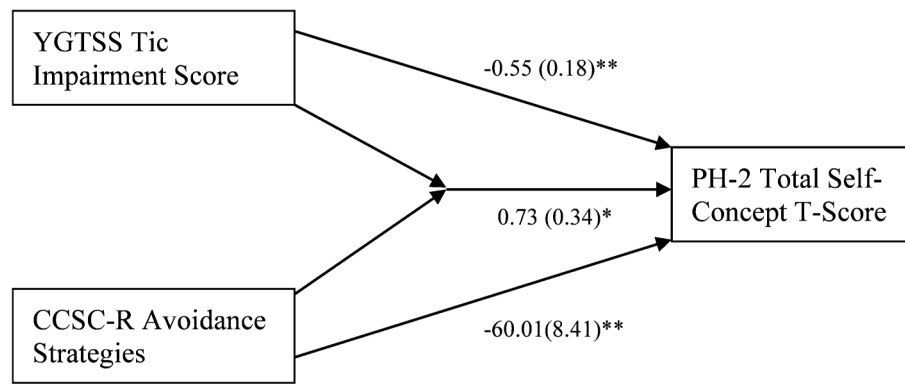


Fig. 1. Self-concept mediates the relationship between tic symptom severity and child-reported depression. Path coefficients and standard error are reported for direct and indirect effects. * $p < 0.05$; ** $p < 0.01$

**Fig. 2.**

The interaction between tic impairment and avoidance strategies moderates youth's self-concept. Path coefficients and standard error are reported for direct effects and interaction effects. * $p < 0.05$; ** $p < 0.01$

Table 1

Demographics and clinical characteristics of sampled youth with CTD (N = 97)

	N (%)
Race/ethnicity ^a	
Hispanic	15 (16 %)
Asian	4 (4 %)
African American	4 (4 %)
Pacific Islander	1 (1 %)
Caucasian	74 (76 %)
Tic diagnoses ^b	
Tourette Disorder (TD)	90 (93 %)
Chronic Tic Disorder (CTD)	7 (7 %)
Comorbid diagnoses ^c	
Attention deficit hyperactivity disorder (ADHD)	47 (49 %)
Obsessive compulsive disorder (OCD)	43 (44 %)
Depressive Disorders	10 (10 %)
Anxiety Disorders ^d	27 (28 %)
Oppositional defiant disorder (ODD)	16 (17 %)
Autism Spectrum Disorder (ASD)	10 (10 %)
Mean (SD)	
Age in years	11.07 (2.89)
PH-2 Total Score	48.73 (10.77)
YGTSS Total Tic Severity Score	21.91 (9.78)
YGTSS Impairment	15.62 (14.02)
SNAP-IV Inattentive score	1.57 (0.90)
SNAP-IV Hyperactive/Impulsive Score	1.11 (0.80)
SNAP-IV Oppositional Score	1.14 (0.84)
CCSC-R Active Coping	0.51 (0.11)
CCSC-R Avoidance	0.46 (0.15)
CCSC-R Support Seeking	0.40 (0.15)
CCSC-R Distraction	0.59 (0.14)
CY-BOCS Total Score	11.41 (10.34)
CDI-S Total T-Score	49.24 (13.23)
CBCL Internalizing Scale T-Score	62.16 (11.31)
CBCL Externalizing Scale T-Score	56.55 (11.78)
Peds-QL-FIM Total Mean Score	63.37 (20.14)

CTD Chronic Tic Disorders, PH-2 Piers-Harris Children's Self-Concept Scale 2nd Edition, YGTSS Yale Global Tic Severity Scale, SNAP-IV Swanson, Nolan and Pelham Parent Rating Scale, CCSC-R Children's Coping Strategies Checklist—Revision 1, CY-BOCS Children's Yale-Brown Obsessive-Compulsive Scale, CDI-S Children's Depression Inventory-Short Form, CBCL Child Behavior Checklist, Peds-QL-FIM The PedsQL Family Impact Module

^a Multiple racial and/or ethnicity categories could be selected

^b TD, CTD and comorbid diagnoses were established by PhD/MD investigators with additional expert review by PI, aided by extensive medical records review, clinical interview and comprehensive rating scales

^c Consensus diagnoses were unavailable for one participant ($n = 96$)

^d Anxiety Disorders included generalized anxiety disorder ($n = 14$), separation anxiety disorder ($n = 3$), anxiety disorder—not otherwise specified ($n = 10$)

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Table 2

Participants’ self-concept scores and their demographic and clinical correlates

Piers-Harris-2	Mean (SD)	Age	YGTS Total Tic Severity	YGTS Total Tic Impairment	SNAP Inattention Score	SNAP Hyperactivity/Impulsivity Score	SNAP ODD Score	CY-BOCS Total Score	CDI-S Total T-Score	CBCL Internalizing Score	CBCL Externalizing Score	Peds-QL-FIM Total Mean Score
Total T-score	48.73 (10.77)	-.18	-.29**	-.33****	-.37****	-.36****	-.35****	-.38****	-.58****	-.45****	-.34****	.42****
BEH T-score	49.10 (9.64)	-.01	-.30**	-.18	-.42****	-.52****	-.47****	-.30**	-.40****	-.31**	-.44****	.36****
INT T-score	49.31 (8.44)	-.08	-.23*	-.34****	-.43****	-.37****	-.29****	-.28**	-.43****	-.30**	-.25*	.31**
PHY T-score	49.80 (9.11)	-.12	-.23*	-.31**	-.22*	-.17	-.17	-.19	-.42****	-.35****	-.19	.27**
FRE T-score	48.91 (10.10)	-.21*	-.23*	-.31**	-.26**	-.20	-.25*	-.49****	-.55****	-.51****	-.31**	.45****
POP T-score	47.46 (10.89)	-.24*	-.26**	-.25*	-.20*	-.26*	-.16	-.24*	-.55****	-.41****	-.20	.27**
HAP T-score	49.17 (8.74)	-.25*	-.26*	-.19	-.17	-.14	-.29**	-.33****	-.60****	-.38****	-.30**	.29**

Piers-Harris-2 = Piers-Harris Children’s Self-Concept Scale Second Edition (subscales include: *BEH* behavioral adjustment, *INT* Intellectual and School Status, *PHY* Physical Appearance and Attributes, *FRE* Freedom from Anxiety, *POP* Popularity, *HAP* Happiness and Satisfaction); *YGTS* Yale Global Tic Severity Scale, *SNAP-IV* Swanson, Nolan and Pelham Parent Rating Scale, *ODD* Oppositional Defiance Disorder, *CY-BOCS* Children’s Yale Brown Obsessive–Compulsive Scale, *CDI-S* Children’s Depressive Inventory-Short form, *CBCL* Child Behavior Checklist, *Peds-QL-FIM* The PedsQL Family Impact Module

* $p < 0.05$;
** $p < 0.01$;
*** $p < 0.001$